TAD07 – (A8 Notes) UV-Vis Spectroscopy

Name …….

1. A.8.1 Describe the effect of different ligands on the splitting of the d orbitals in transition metal complexes. (2)
    a. *The ligands should include NH3, H2O and Cl–.*
    b. Which elements appear colourful in the 3d block? Which do not, and why?

    c. What is a ligand? What type of bonds do they form? Explain their character in terms of acid/base theory:

    d. What is the coordination number?

    e. Explain how a transition metal "splits" its 3d subshells to appear colored:

2. A.8.2 Describe the factors that affect the color of transition metal complexes. (2)
    a. *Include the identity of the metal ion (for example, Mn2+ or Fe2+), the oxidation number of the metal (for example, for Fe, +2 or +3) and the identity of the ligand (for example, NH3 or H2O). These factors will be assessed only for octahedral complexes in aqueous solution.*
    b. What factors affect the Ligand Field Splitting Energy (color)

        i. Example for the nature of the ligand:

        ii. Example for the nature of the ligand AND coordination number:

    c. Provide a list of the orbital splitting power of various nucleophiles:

3. A.8.3 State that organic molecules containing a double bond absorb UV radiation. (1)
    a. *Refer to conjugated and delocalized systems, including arenes, alkenes and chlorophyll.*
    b. Compounds that absorb UV light:
        i. Molecules containing double bonds

        ii. Conjugated Systems:

    c. How is a UV Sample Prepared?

4. A.8.4 Describe the effect of the conjugation of double bonds in organic molecules on the wavelength of the absorbed light. (2)
    a. *Examples should include retinol and phenolphthalein.* ***Aim 8:*** *The application of this in sun creams could be discussed.*
    b. How does the conjugation effect the absorbance of UV light?

    c. What happens when a molecule becomes quite extensive in its conjugation?

5. A.8.5 Predict whether or not a particular molecule will absorb UV or visible radiation. (3)
    a. Refers back to A.8.4
6. A.8.6 Determine the concentration of a solution from a calibration curve using the Beer–Lambert law.(3)
    a. How is absorbance measured?

    b. How does concentration affect absorbance?

    c. How does the path length affect absorbance?

    d. Provide the Beer-Lambert Law and describe the variables:

    e. In order to take advantage of the Beer-Lambert Law a calibration curve must be made. Explain:

Before a sample is run, you MUST HAVE the a similar graph to the following, why? How do you get this?

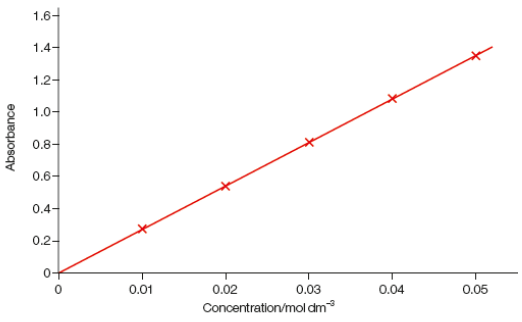

Figure 21.131 Absorbance versus concentration for substance X